467g Biological Templates for Inorganic Nanoparticle and Nanostructure Synthesis

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Biomimetic approaches to inorganic materials synthesis brings together biology, chemistry and materials science in order to form nanomaterials with improved properties, compared to traditional synthesis methods. Biological templates, including peptides, proteins and viruses, are used as templates for synthesis of inorganic nanoparticles under ambient temperatures and neutral pH. We are interested in, first, understanding how biological organisms control the nucleation and growth of inorganic materials, and use silica deposition in diatoms as a paradigm for this process. We then extend this knowledge to understand how inorganic materials can be made in vitro using biological templates. Phage display has been a powerful technique for identifying peptides that will nucleate and grow inorganic nanoparticles from precursor solutions. Additionally, fusion constructs between peptides that bind inorganics or between inorganic-binding peptides and protein cages, such as ferritin, have led to multi-component, self-assembled nanostructures. We are currently investigating methods to understand and control the growth parameters of the nanoparticles during biomimetic synthesis. In this talk, I will present data from our efforts on selection of biological templates for synthesis of inorganic nanomaterials and extension of these templates to build nanostructures on substrates or in solution.